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ABSTRACT

Measuring student progress toward higher achievement has been the purpose of the National Assessment of Educational Progress (NAEP) since its inception in 1969. Students in both public and nonpublic schools have been assessed in various subject areas on a regular basis. This report presents results of the 1994 NAEP trend assessments in science, mathematics, reading, and writing. To provide a numeric summary of students' performance on the assessment questions and tasks, the NAEP uses a 0-to-500 scale for each subject area. Nationally representative samples of approximately 31,000 students were involved in the NAEP 1994 trend assessments. Trend assessment results are included for each area, going back to: 1969-70 in science; 1973 in mathematics; 1971 in reading; and 1984 in writing. Trends are discussed for students at ages 9, 13, and 17 for science, mathematics, and reading, and for students in grades 4, 8, and 11 for writing. Trends in performance differences among ethnic and racial groups are also discussed. Tests of linear and quadratic trends were supplemented by a second set of statistical tests that compared results for selected pairs of assessment years within each trend sequence. In general, trends in science and mathematics show early declines or relative stability, followed by improved performance, but reading and writing results show few indications of positive trends. (Contains 4 figures and 10 tables.) (SLD)

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REPORT IN BRIEF

NAEP 1994 Trends in Academic Progress

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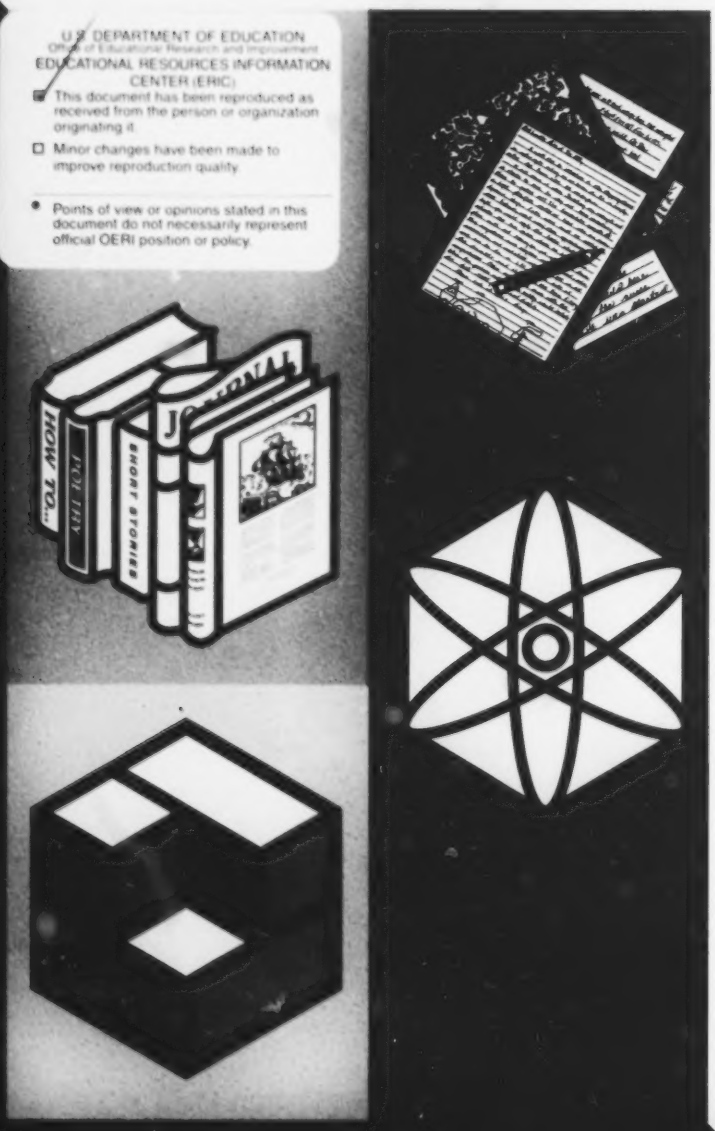

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In 1988, Congress established the National Assessment Governing Board (NAGB) to formulate policy guidelines for NAEP. The Board is responsible for selecting the subject areas to be assessed from among those included in the National Education Goals; for setting appropriate student performance levels; for developing assessment objectives and test specifications through a national consensus approach; for designing the assessment methodology; for developing guidelines for reporting and disseminating NAEP results; for developing standards and procedures for interstate, regional, and national comparisons; for determining the appropriateness of test items and ensuring they are free from bias; and for taking actions to improve the form and use of the National Assessment.

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REPORT IN BRIEF

NAEP 1994 Trends in Academic Progress

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October 1996

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Introduction

Educational reform continues to be a major concern of parents, educators, and policy makers, as well as the general public. Reorganizing schools, enhancing the curriculum, establishing performance standards, and rethinking traditional instructional methods are just some of the efforts being made across the country to increase student achievement. As a part of these efforts, in 1990 the President and governors adopted a set of six ambitious national education goals for the 21st century: ensuring that children start school ready to learn, raising high school graduation rates, increasing levels of educational achievement, promoting science and mathematics achievement as well as literacy and lifelong learning, and freeing schools of drugs and violence.[1] In the Spring of 1994, Congress broadened the goals to include improvements in teacher preparation and increased parental involvement in schools.[2]

Measuring students' progress toward higher achievement has been the purpose of the National Assessment of Educational Progress (NAEP) since its inception in 1969. Students in both public and nonpublic schools have been assessed in various subject areas on a regular basis. In addition, NAEP

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[1] Executive Office of the President, *National Goals for Education*. (Washington, DC: Government Printing Office, 1990).

[2] Goals 2000: Educate America Act, Pub. L. No. 103-227 (1994).

collects information about relevant background variables that provide an important context for interpreting the assessment results and for documenting the extent to which educational reform has been implemented.

One important feature of NAEP is its ability to monitor trends in academic achievement in core curriculum areas over an extended period of time. By readministering materials and replicating procedures from assessment to assessment, NAEP provides valuable information about progress in academic achievement and about whether the United States can meet the challenge of its national education goals.

The NAEP long-term trend assessments are separate from the main assessments conducted by NAEP that involve more recently developed instruments. While the long-term trend assessments have used the same sets of questions and tasks so that trends across time can be measured, the main assessments in each subject area have been developed to reflect current educational priorities. The use of both long-term trend and main assessments allows NAEP to provide information about students' achievement over time, and assess their achievement of more contemporary educational objectives. As each of these assessments is based on different sets of questions or tasks, the results from each cannot be directly compared.

This report presents results of the NAEP 1994 trend assessments in science, mathematics, reading, and writing. To provide a numeric summary of students' performance on the assessment questions and tasks, NAEP uses a 0 to 500 scale for each subject area. Comparisons of average scale scores are provided across the years in which trend assessments have been administered and among subpopulations of students. National representative samples totaling approximately 31,000 students were involved in the NAEP 1994 trend assessments.

In the following sections of this report, trend assessment results are given in science, mathematics, reading and writing. These results chart trends going back to the first year in which each NAEP assessment was given: 1969/70 in science; 1973 in mathematics; 1971 in reading; and 1984 in writing. Trends in average performance over these time periods are discussed for students at ages 9, 13, and 17 for the science, mathematics, and reading assessments and for grades 4, 8, and 11 for the writing assessment. Trends in average performance differences between White students and Black students, White students and Hispanic students, and male students and female students are also discussed.

The descriptions of trend results are based on the results of statistical tests that consider both the estimates of average performance in each assessment year as well as the degree of uncertainty associated with these

estimates. The purpose of basing descriptions on such tests is to restrict the discussion of observed trends and group differences to those that are statistically dependable. Hence, the patterns of results that are discussed are unlikely to be due to the chance factors associated with the inevitable sampling and measurement errors inherent in any large-scale survey effort like NAEP. Throughout this report, all descriptions of trend patterns, differences between assessment years, and differences between subgroups of students which are cited are statistically significant at the .05 level.

Two distinct sets of statistical tests have been applied to the trend results. First, each sequence of assessment results (whether it be overall performance or differences in performance for race/ethnicity and gender subgroups) was tested for linear and quadratic trends. Separate tests were carried out in each subject area at each age or grade level. The purpose of this first set of general tests was to determine whether the results of the series of assessments in a given subject could be generally characterized by a line or a simple curve. A linear relationship indicates that results have steadily increased (or decreased) at a relatively constant rate over the time period of interest. Simple curvilinear (i.e., quadratic) relationships capture more complex patterns. For example, one possible pattern is to have initial score declines over part of the time period followed by score increases in more recent assessments. Another possible pattern is to have a sequence of several assessments in which scores have increased followed by a period of relative stable assessment performance. These examples are two, but not all, of the simple curvilinear relationships that were tested.

Simple linear and curvilinear patterns do not always provide a satisfactory summary description of the pattern of trend results. Hence, tests of linear and quadratic trends were supplemented by a second set of statistical tests which compared results for selected pairs of assessment years within each trend sequence. Again, separate tests were carried out in each subject area at each age or grade level. Two families of pairwise tests were carried out. One family of tests consisted of comparing the results from each trend assessment year to the results for the first assessment year. The second family of tests consisted of comparing the results from each trend assessment year to the 1994 results. The statistical tests in both families were carried out at a significance level that adjusted for the multiple comparisons being carried out within each family. The characterizations of trend data that appear below are based on the combined results of both the general (i.e., linear and quadratic) and the two families of pairwise tests.

Overall Trends in Average Scale Scores

The overall trends in science, mathematics, reading, and writing achievement are presented in Figure 1. In general, the trends in science and mathematics show early declines or relative stability followed by improved performance, but reading and writing results show few indications of positive trends.[3]

Science. Students in all three age groups demonstrated declines in science performance in the 1970s, but have since improved. In 1994, the improvements resulted in an average score for 9-year-olds that was higher than that in 1970. However, the 1994 average score for 13-year-olds was not significantly different than that in 1970, and the 1994 average score for 17-year-olds was lower than the 1969 average.

Mathematics. The overall picture of mathematics achievement provided by the long-term trend results is one of early declines or relative stability followed by a pattern of increased performance. For 9-year-olds, average scale scores began to increase with the 1990 assessment and were higher in 1994 than in 1973. For 13-year-olds, average scores began to increase with the 1982 assessment, resulting in a 1994 average score higher than the average score in 1973. For 17-year-olds, after a period of decline from 1973 to 1982, the average score increased to a level in 1994 that did not differ significantly from that in 1973.

Reading. The overall picture of trends in reading achievement is one of only minimal changes across the assessment years. At age 9, higher levels of performance that were observed in the 1980s have not been maintained, and in 1994 the average score returned to a level not significantly different from that in 1971. The average score of 13-year-olds increased in 1992 to a level that was higher than in 1971. However, the 1994 average score did not differ significantly from either the 1971 or 1992 averages. Seventeen-year-olds had average scores from 1988 to 1992 that were higher than the 1971 average. However, the 1994 average score was not significantly different from that in either 1971 or 1992.

Writing. Across the three grades assessed in writing, mixed results were observed. Fourth graders had relatively stable performance across the assessment years. At the eighth grade, a decline observed in 1990 was reversed in 1992. However, the average score decreased from 1992 to 1994, resulting in an average score that was not significantly different from that in 1984. The average score of eleventh graders decreased from 1984 to 1994.

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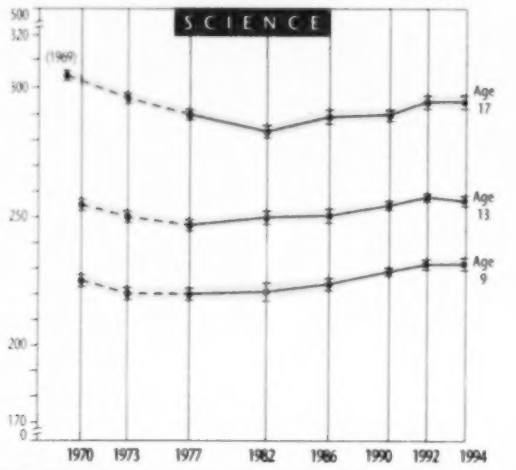
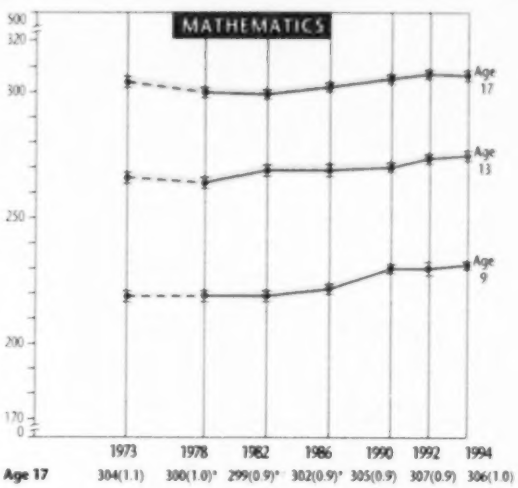
[3] The examination of overall trends includes discussions of statistically significant linear and quadratic trends. For science, linear (positive for ages 9 and 13, and negative for age 17) and quadratic (positive for all three ages) trends were noted. For mathematics, positive linear and quadratic trends were noted for all three ages. For reading, positive linear trends were noted for ages 13 and 17, and a negative quadratic trend was noted for age 9. For writing, a negative linear trend was noted for grade 11 and a positive quadratic trend was noted for grade 8.

Figure 1

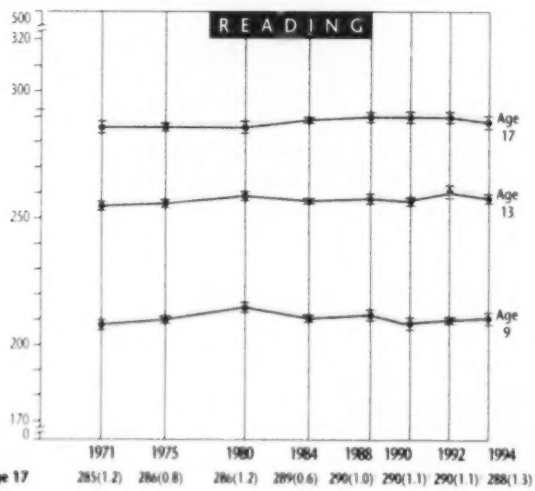
National Trends in Average Scale Scores in Science, Mathematics, Reading, and Writing



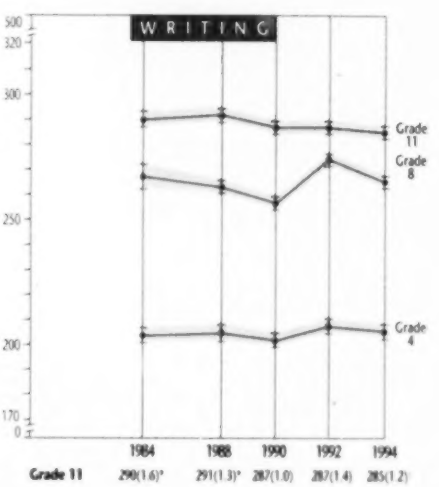
	1970	1973	1977	1982	1986	1990	1992	1994
Age 17	305(1.0)*	296(1.0)	290(1.0)	288(1.2)*	289(1.4)	290(1.1)	294(1.3)	294(1.6)
Age 13	255(1.1)	250(1.1)*	247(1.1)*	250(1.3)*	251(1.4)*	255(0.9)	258(0.8)	257(1.0)
Age 9	225(1.2)*	220(1.2)*	220(1.2)*	221(1.8)*	224(1.2)*	229(0.8)	231(1.0)	231(1.2)



	1973	1978	1982	1986	1990	1992	1994
Age 17	304(1.1)	300(1.0)*	299(0.9)*	302(0.9)*	305(0.9)	307(0.9)	306(1.0)
Age 13	266(1.1)*	264(1.1)*	269(1.1)*	269(1.2)*	270(0.9)*	273(0.9)	274(1.0)
Age 9	219(0.8)*	219(0.8)*	219(1.1)*	222(1.0)*	230(0.8)	230(0.8)	231(0.8)



	1971	1975	1980	1984	1988	1990	1992	1994
Age 17	285(1.2)	286(0.8)	286(1.2)	289(0.6)	290(1.0)	290(1.1)	290(1.1)	288(1.3)
Age 13	255(0.9)	256(0.8)	259(0.9)	257(0.5)	258(1.0)	257(0.8)	260(1.2)	258(0.9)
Age 9	208(1.0)	210(0.7)	215(1.0)	211(0.7)	212(1.1)	209(1.2)	211(0.9)	211(1.2)



	1984	1988	1990	1992	1994
Grade 11	299(1.6)*	291(1.3)*	287(1.0)	287(1.4)	285(1.2)
Grade 8	267(2.0)	264(1.3)	257(1.2)*	274(1.3)*	265(1.3)
Grade 4	204(1.5)	206(1.6)	202(1.5)	207(1.5)	205(1.6)

I 95 percent confidence interval. [- - -] Extrapolated from previous NAEP analyses.

* Statistically significant difference from 1994 at 5 percent combined significance level per set of comparisons.

† Statistically significant difference from 1969-70 for science, 1973 for mathematics, 1971 for reading and 1984 for writing at 5 percent combined significance level per set of comparisons. The standard errors of the estimated scale scores appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

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Trends in Average Scale Scores by Race/Ethnicity and by Gender

Changes in average scale scores on the NAEP trend assessments in science, mathematics, reading, and writing are presented by race/ethnicity and gender in Table 1. Results are presented for 1994 and the first trend assessment in each subject area — 1969 or 1970 for science, 1973 for mathematics, 1971 for reading, and 1984 for writing. (For results from intervening years, see the *NAEP 1994 Trends in Academic Progress*.)

Science. White 9- and 13-year-old students had higher average science scores in 1994 than in 1970. The average score of 17-year-old White students, however, was lower. Nine-year-old Black students and 13-year-old Hispanic students showed an increase in average scores between the first and most recent assessment.[4] At age 9, female students had a higher average score in 1994 than in 1970. At age 17, both male and female students, reflecting the national trend results, had lower scores in the most recent assessment.

Mathematics. In mathematics, White 9- and 13-year-olds had higher average scores in 1994 than in 1973. A higher average score in the most recent assessment was also observed for Black students in each age group, and for Hispanic students aged 13 and 17. At ages 9 and 13, both males and females had average mathematics scale scores in 1994 that were higher than those of their counterparts in 1973.

Reading. White 13-year-olds attained an average score in 1994 that was higher than that attained by their counterparts in 1971. At all three ages, Black students displayed a gain in average scale scores between 1971 and 1994. The average scores of male 9-year-olds and female 13-year-olds were higher in 1994 than the average scores earned by their counterparts in the first trend assessment.

Writing. Reflecting the overall performance of students on the trend writing assessments, no significant changes were observed between 1984 and 1994 in the average scores of fourth- and eighth-grade students by race/ethnicity and by gender. At the eleventh grade, the average score of White students in 1994 was lower than the average score of their counterparts in 1984.

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[4] For Hispanic students, the science differences are calculated between 1977 and 1994.

Table 1

Trends in Average Scale Scores in Science, Mathematics, Reading, and Writing by Race/Ethnicity and Gender

	AGE 9		AGE 13		AGE 17	
	Average Scale Score					
SCIENCE	**1970**[1]	**1994**	**1970**[1]	**1994**	**1969**[1]	**1994**
Nation	225(1.2)*	231(1.2)	255(1.1)	257(1.0)	305(1.0)*	294(1.6)
White	236(0.9)*	240(1.3)	263(0.8)*	267(1.0)	312(0.8)*	306(1.5)
Black	179(1.9)*	201(1.7)	215(2.4)	224(4.2)	258(1.5)	257(3.1)
Hispanic	192(2.7)	201(2.7)	213(1.9)*	232(2.4)	262(2.2)	261(6.7)
Male	228(1.3)	232(1.3)	257(1.3)	259(1.2)	314(1.2)*	300(2.0)
Female	223(1.2)*	230(1.4)	253(1.2)	254(1.2)	297(1.1)*	289(1.7)
	Average Scale Score					
MATHEMATICS	**1973**	**1994**	**1973**	**1994**	**1973**	**1994**
Nation	219(0.8)*	231(0.8)	266(1.1)*	274(1.0)	304(1.1)	306(1.0)
White	225(1.0)*	237(1.0)	274(0.9)*	281(0.9)	310(1.1)	312(1.1)
Black	190(1.8)*	212(1.6)	228(1.9)*	252(3.5)	270(1.3)*	286(1.8)
Hispanic	202(2.4)	210(2.3)	239(2.2)*	256(1.9)	277(2.2)*	291(3.7)
Male	218(0.7)*	232(1.0)	265(1.3)*	276(1.3)	309(1.2)	309(1.4)
Female	220(1.1)*	230(0.9)	267(1.1)*	273(1.0)	301(1.1)	304(1.1)
	Average Scale Score					
READING	**1971**[1]	**1994**	**1971**[1]	**1994**	**1971**[1]	**1994**
Nation	208(1.0)	211(1.2)	255(0.9)	258(0.9)	285(1.2)	288(1.3)
White	214(0.9)	218(1.3)	261(0.7)*	265(1.1)	291(1.0)	296(1.5)
Black	170(1.7)*	185(2.3)	222(1.2)*	234(2.4)	239(1.7)*	266(3.9)
Hispanic	183(2.2)	186(3.9)	233(3.0)	235(1.9)	252(3.5)	263(4.9)
Male	201(1.1)*	207(1.3)	250(1.0)	251(1.2)	279(1.2)	282(2.2)
Female	214(1.0)	215(1.4)	261(0.9)*	266(1.2)	291(1.3)	295(1.5)
	GRADE 4		GRADE 8		GRADE 11	
	Average Scale Score					
WRITING	**1984**	**1994**	**1984**	**1994**	**1984**	**1994**
Nation	204(1.5)	205(1.6)	267(2.0)	265(1.3)	290(1.6)*	285(1.2)
White	211(1.9)	214(1.5)	272(2.1)	272(1.4)	297(1.8)*	291(1.4)
Black	182(5.0)	173(3.2)	247(5.7)	245(3.4)	270(3.6)	267(2.2)
Hispanic	189(5.8)	189(3.1)	247(6.4)	252(3.3)	259(6.6)	271(4.0)
Male	201(2.8)	196(1.7)	258(2.3)	254(1.8)	281(1.4)	276(1.5)
Female	208(3.1)	214(2.2)	276(2.4)	278(1.4)	299(2.5)	293(1.5)

[1] NOTE: For Hispanic students, the science differences are calculated between 1977 and 1994, and the reading differences are calculated between 1975 and 1994.

*Statistically significant difference from 1994, at a 5 percent combined significance level per set of comparisons. The set of comparisons include all intervening assessment years. (See the *NAEP 1994 Trends in Academic Progress* for complete results.) The standard errors of the estimated scale scores appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

Trends in Differences in Average Scale Scores Between Racial/Ethnic Groups of Students and Between Males and Females

As noted earlier, one of the national education goals emphasizes increases in students' academic achievement.[5] A stated objective of this goal is that the performance distribution for minority students will more closely reflect that of the student population as a whole. In some subject areas, results indicated progress toward meeting this goal. Trends in the differences between average scores for subgroups of students are reported in this section.[6]

Differences between White and Black Students. Trend analyses of the differences between White and Black students' average scale scores at each age revealed an overall pattern of narrowing gaps in mathematics and reading, resulting in a smaller gap between White and Black students in 1994 than in the first trend assessment. (The 1971 and 1994 gaps for 13-year-olds in reading were not significantly different.) However, there was some indication that the gap has increased since the late 1980s for 13-year-olds in mathematics and for all ages in reading (see Figure 2). The gap between White and Black students in science scores has decreased for 9- and 17-year-olds. However, for 17-year-olds the gap was not significantly different in 1994 than in 1969. At age 13, the gap between White and Black students in science scores decreased slightly until 1986. Since that time it returned to a level not significantly different from that in 1970. The gap between White and Black students' average writing scores has remained relatively stable since 1984 at each grade. Despite a narrowing of the gap between the average performance of White and Black students in three of the four subject areas assessed, in 1994 White students at all three ages or grades had average scores in each subject area that were higher than the average scores of Black students.

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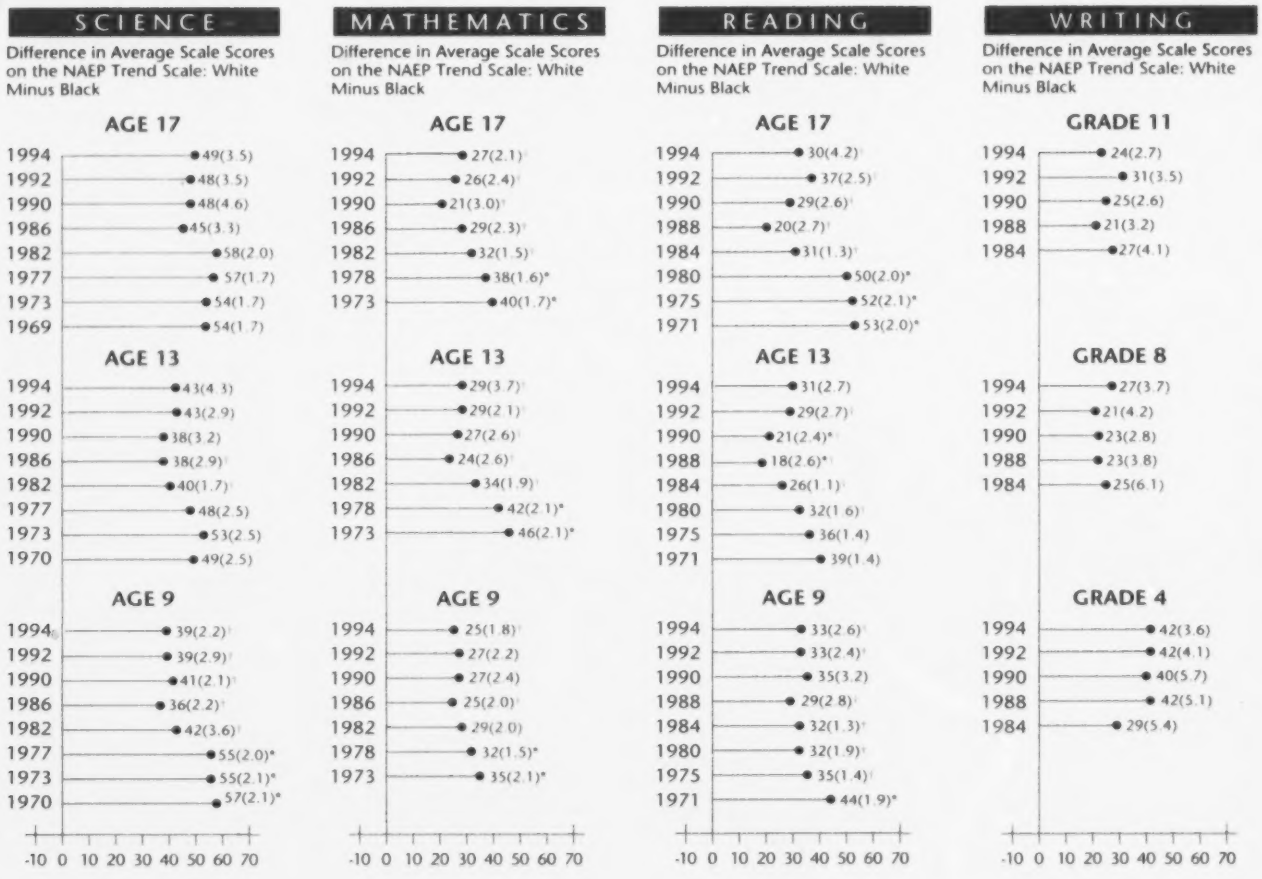
[5] Executive Office of the President, *National Goals for Education*. (Washington, DC: Government Printing Office, 1990).

[6] Complete results for various subgroups in each assessment year are presented in the *NAEP 1994 Trends in Academic Progress*.

Figure 2

Trends in Differences in Average Scale Scores of White and Black Students Across Subject Areas



* Statistically significant difference from 1994, at a 5 percent combined significance level per set of comparisons.

† Statistically significant difference from the initial assessment year in each subject. The standard errors of the estimated differences in scale scores appear in parentheses. It can be said with 95-percent certainty that for each population of interest, the value for the whole population is within plus or minus two standard errors for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

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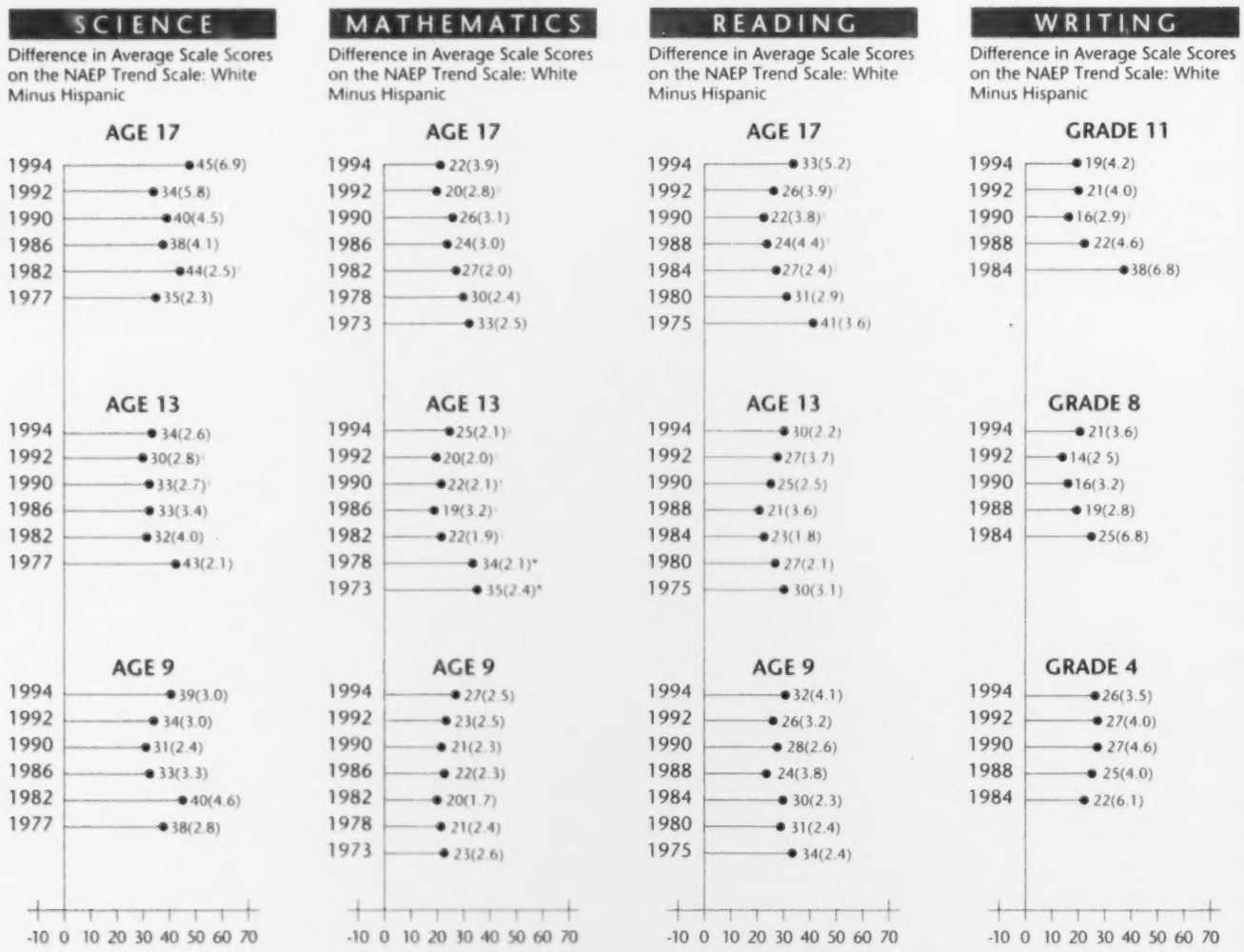
Differences between White and Hispanic Students. Trend analyses of the differences between White and Hispanic students' average scale scores revealed an overall pattern of narrowing gaps for 17-year-olds in mathematics and reading, and for eleventh graders in writing. A similar pattern was observed for 13-year-olds in science and mathematics (see Figure 3). However, there was some indication that the trend of narrowing gaps reversed during recent assessments for 17-year-olds in reading and for 13-year-olds in science and mathematics. When differences between White and Hispanic students in the first assessment were compared to those in the most recent assessment, only one instance of a statistically significant change was revealed: the difference between White and Hispanic 13-year-olds' mathematics scores in 1994 was smaller than that observed in the first assessment. In 1994 the average scores of White students at all three ages or grades were higher than the average scores of Hispanic students in all subject areas.

Figure 3

Trends in Differences in Average Scale Scores of White and Hispanic Students Across Subject Areas



* Statistically significant difference from 1994, at a 5 percent combined significance level per set of comparisons.

† Statistically significant difference from the initial assessment year in each subject. The standard errors of the estimated differences in scale scores appear in parentheses. It can be said with 95-percent certainty that for each population of interest, the value for the whole population is within plus or minus two standard errors for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

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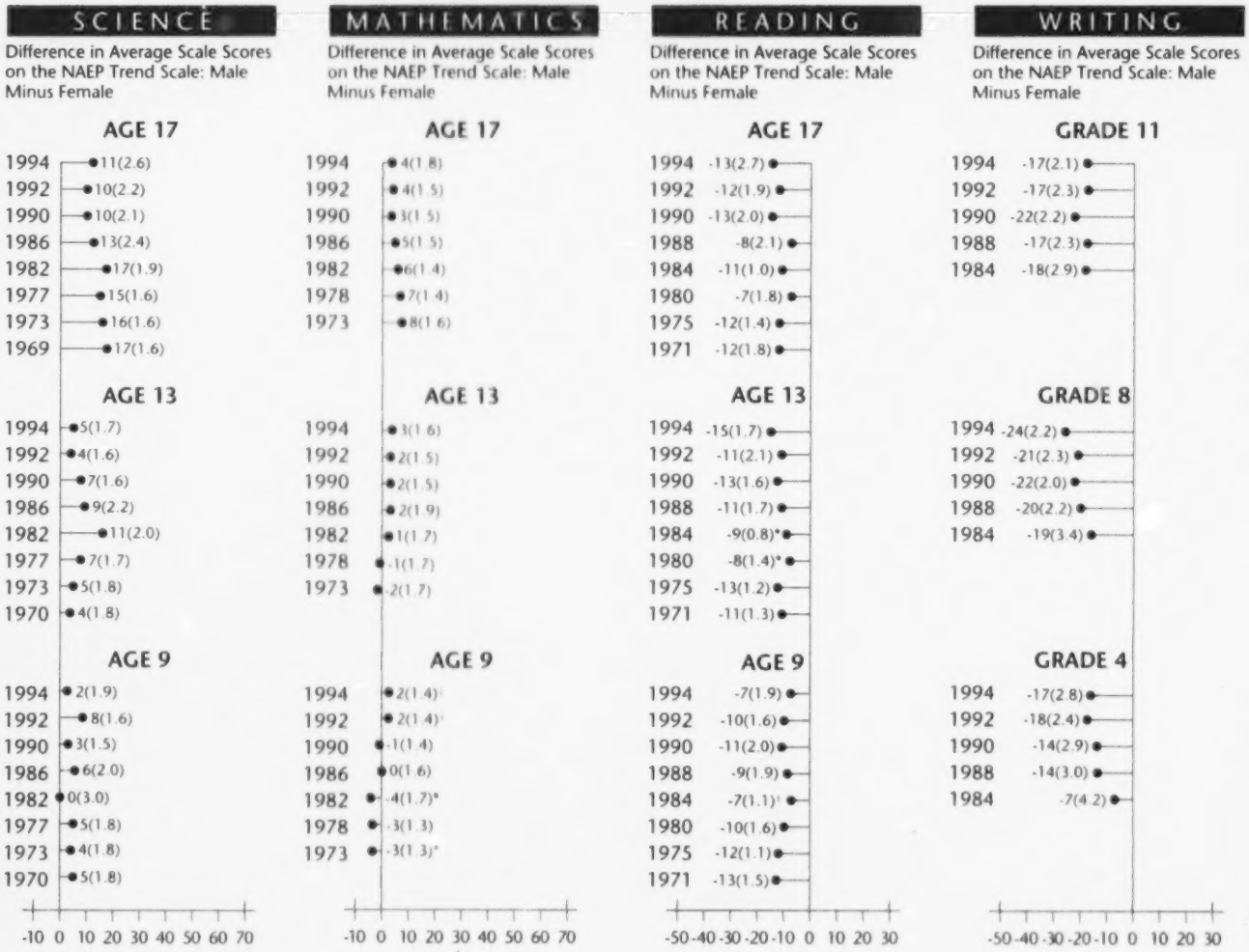
Differences between Males and Females. Trend analyses of the differences between male and female students' average scale scores revealed an overall pattern of narrowing gaps for 17-year-olds in science and mathematics and for 9-year-olds in reading (see Figure 4). In science and mathematics, average scores were higher for males than for females, but in reading, females had higher average scores than males. The difference between fourth-grade male and female students' average writing scores increased across the assessment years, widening the gap in which females outperformed males. Trend analyses of the mathematics score gaps between male and female students aged 9 and 13 revealed a shift across time. At both ages, the trend was away from females outperforming males and toward either no difference or males outperforming females.

In 1994, the average science and mathematics scores of 13- and 17-year-old male students was higher than the average scores of their female counterparts. No significant difference between 9-year-old males and females in 1994 was observed in either science or mathematics. Across all three ages or grades in 1994, female students had higher average reading and writing scores than their male peers.

Figure 4

Trends in Differences in Average Scale Scores of Male and Female Students Across Subject Areas



* Statistically significant difference from 1994, at a 5 percent combined significance level per set of comparisons.

† Statistically significant difference from the initial assessment year in each subject. The standard errors of the estimated differences in scale scores appear in parentheses. It can be said with 95-percent certainty that for each population of interest, the value for the whole population is within plus or minus two standard errors for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

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Trends in Levels of Performance

To permit a closer look at the achievement of students in age groups or grades, five levels of performance have been identified and described along the NAEP scale for each subject area — 150, 200, 250, 300, and 350.[7] The procedure for describing the five performance levels was the same in science, mathematics, and reading. Sets of questions more likely to be answered correctly by students at one level, than at the next lower level, were identified. Educators and curriculum experts representing each of the subject areas then carefully studied the sets of questions to develop descriptions for the five levels. These descriptions outline the concepts, procedures, or processes associated with correct responses to the questions at each level.

The procedure for describing the writing performance levels was somewhat different. Because the NAEP writing assessment is a direct measure of students' writing abilities, it does not contain questions or tasks that can be scored as correct or incorrect. Instead, students' responses to the writing tasks are rated according to the extent of task accomplishment. The description of the five writing performance levels were developed by examining the ratings received by students whose overall performance was at one level in comparison to the ratings received by students at the next lower level.

Information about trends in students' performance at the scale levels is available back to 1977 in science, 1978 in mathematics, 1971 in reading, and 1984 in writing.

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[7] In theory, performance levels above 350 or below 150 could have been defined; however, so few students in the assessment performed at the extreme ends of the subject-area scales that it was not practical to do so.

Tables 2 through 5 present the percentages of students performing at or above each of the five levels. In addition, the summary descriptions that characterized students' performance at each level are provided.

- Compared to 1977 for science and 1978 for mathematics, higher percentages of 9-year-olds in 1994 demonstrated understanding of the fundamentals in both subject areas (Levels 150, 200, and 250). However, no significant change occurred in the percentages of students at age 9 or grade 4 reaching any level of performance on the reading or writing scales.

- At age 13, virtually all students reached Level 150 in science and mathematics, and gains were observed in the percentages of students at or above Levels 200 and 250. Few changes were observed in levels of reading and writing performance. In reading, a larger percentage of 13-year-olds reached Level 300 in 1994 than in 1971. In writing, there were no statistically significant changes at grade 8.

- At age 17, the only change observed in science performance levels was an increase in the percentage of students reaching at least Level 300. In mathematics, 17-year-olds made gains at Levels 250 and 300. No significant change at any performance level was observed in reading. The percentage of eleventh graders at or above Level 250 in writing declined between 1984 and 1994.

Table 2

Percentages of Students Performing At or Above Science Performance Levels, Ages 9, 13, and 17, 1977 and 1994

Level	AGE 9		AGE 13		AGE 17	
	Percent in 1977	Percent in 1994	Percent in 1977	Percent in 1994	Percent in 1977	Percent in 1994
350 Can infer relationship and draw conclusions using detailed scientific knowledge	0(0.0)	0(0.1)	1(0.1)*	0(0.1)	9(0.4)	10(0.8)
300 Has some detailed scientific knowledge and can evaluate the appropriateness of scientific procedures	3(0.3)	4(0.4)	11(0.5)	12(0.9)	42(0.9)*	48(1.3)
250 Understands and applies general information from the life and physical sciences	26(0.7)*	34(1.2)	49(1.1)*	60(1.1)	82(0.7)	83(1.2)
200 Understands some simple principles and has some knowledge, for example, about plants and animals	68(1.1)*	77(1.1)	86(0.7)*	92(0.6)	97(0.2)	97(0.7)
150 Knows everyday science facts	94(0.6)*	97(0.4)	99(0.2)*	100(0.1)	100(0.0)	100(0.1)

* Statistically significant difference from 1994, at a 5 percent combined significance level per set of comparisons. The set of comparisons include all NAEP science trend assessments between 1977 and 1994. (See the *NAEP 1994 Trends in Academic Progress* for complete results.) Significance tests for extreme percentages (either >90 or <10 percent) should be interpreted with caution. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

Table 3

Percentages of Students Performing At or Above Mathematics Performance Levels, Ages 9, 13, and 17, 1978 and 1994

Level	AGE 9		AGE 13		AGE 17	
	Percent in 1978	Percent in 1994	Percent in 1978	Percent in 1994	Percent in 1978	Percent in 1994
350 Can solve multi-step problems and use beginning algebra	0(0.0)	0(0.0)	1(0.2)	1(0.2)	7(0.4)	7(0.8)
300 Can compute with decimals, fractions, and percents; recognize geometric figures; solve simple equations; and use moderately complex reasoning	1(0.1)	1(0.4)	18(0.7)	21(1.4)	52(1.1)*	59(1.4)
250 Can add, subtract, multiply, and divide using whole numbers, and solve one-step problems	20(0.7)*	30(1.1)	65(1.2)*	78(1.1)	92(0.5)*	97(0.5)
200 Can add and subtract two-digit numbers and recognize relationships among coins	70(0.9)*	82(0.7)	95(0.5)*	99(0.3)	100(0.1)	100(0.0)
150 Knows some addition and subtraction facts	97(0.3)*	99(0.2)	100(0.1)	100(0.0)	100(0.0)	100(0.0)

* Statistically significant difference from 1994, at a 5 percent combined significance level per set of comparisons. The set of comparisons include all NAEP mathematics trend assessments between 1978 and 1994. (See the *NAEP 1994 Trends in Academic Progress* for complete results.) Significance tests for extreme percentages (either >90 or <10 percent) should be interpreted with caution. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

Table 4

Percentages of Students Performing At or Above Reading Performance Levels, Ages 9, 13, and 17, 1971 and 1994

Level	AGE 9		AGE 13		AGE 17	
	Percent in 1971	Percent in 1994	Percent in 1971	Percent in 1994	Percent in 1971	Percent in 1994
350 Can synthesize and learn from specialized reading materials	0(0.0)	0(0.0)	0(0.0)	1(0.1)	7(0.4)	7(0.7)
300 Can find, understand, summarize, and explain relatively complicated information	1(0.1)	1(0.3)	10(0.5)*	14(0.8)	39(1.0)	41(1.2)
250 Can search for specific information, interrelate ideas, and make generalizations	16(0.6)	17(1.2)	58(1.1)	60(1.2)	79(0.9)	81(1.0)
200 Can comprehend specific or sequentially related information	59(1.0)	63(1.4)	93(0.5)	92(0.6)	96(0.3)	97(0.5)
150 Can carry out simple, discrete reading tasks	91(0.5)	92(0.7)	100(0.0)	99(0.2)	100(0.1)	100(0.1)

* Statistically significant difference from 1994, at a 5 percent combined significance level per set of comparisons. The set of comparisons include all NAEP reading trend assessments between 1971 and 1994. (See the *NAEP 1994 Trends in Academic Progress* for complete results.) Significance tests for extreme percentages (either >90 or <10 percent) should be interpreted with caution. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

Table 5

Percentages of Students Performing At or Above Writing Performance Levels, Grades 4, 8, and 11, 1984 and 1994

Level	GRADE 4		GRADE 8		GRADE 11	
	Percent in 1984	Percent in 1994	Percent in 1984	Percent in 1994	Percent in 1984	Percent in 1994
350 Can write effective responses containing supportive details and discussion	0(0.0)	0(0.0)	0(0.1)	1(0.2)	2(0.7)	3(0.3)
300 Can write complete responses containing sufficient information	1(0.4)	0(0.2)	13(1.8)	17(1.2)	39(2.4)	33(1.5)
250 Can begin to write focused and clear responses to tasks	10(1.0)	12(0.8)	72(2.6)	67(1.3)	89(1.0)*	85(1.2)
200 Can write partial or vague responses to tasks	54(2.0)	56(2.0)	98(0.9)	96(0.6)	100(0.3)	99(0.2)
150 Can respond to tasks in abbreviated, disjointed, or unclear ways	93(1.3)	92(0.9)	100(0.0)	100(0.1)	100(0.0)	100(0.1)

* Statistically significant difference from 1994, at a 5 percent combined significance level per set of comparisons. The set of comparisons include all NAEP writing trend assessments between 1984 and 1994. (See the *NAEP 1994 Trends in Academic Progress* for complete results.) Significance tests for extreme percentages (either >90 or <10 percent) should be interpreted with caution. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

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Trends in School and Home Contexts for Learning

Students' responses to background questions about school and home contexts for learning provide an important context for understanding students' educational progress. Although mixed results regarding the supportiveness of students' learning environment were observed, some positive trends were indicated in students' reports. For each school and home factor, results from the 1994 trend assessment are compared with results from the first assessment in which information on that contextual factor was collected.

Science and Mathematics Course Work. An increase in science and mathematics course work was observed across the trend assessments, even though the percentage of students taking advanced courses remained low. Between 1986 and 1994, increases were observed in the percentage of 17-year-old students (primarily twelfth graders) taking biology, chemistry, and physics. Trends in mathematics course taking at age 13 (primarily eighth graders) revealed increased percentages of students taking prealgebra and algebra in 1994 compared to 1986.[8]

As shown in Table 6, an increase in more advanced mathematics course work was also reported by 17-year-olds. Between 1978 and 1994, the percentage of 17-year-old students who had studied only prealgebra or general mathematics decreased. Conversely, there was an increase during the same time period in the percentage of 17-year-olds pursuing mathematics course work through algebra II, or precalculus or calculus.

[8] A complete discussion of science and mathematics course-taking patterns is presented in the *NAEP 1994 Trends in Academic Progress*.

Table 6

Highest Level of Mathematics Course Work, Age 17, 1978 and 1994

	PERCENTAGE OF STUDENTS				
	General Mathematics or Prealgebra	Algebra I	Geometry	Algebra II	Precalculus or Calculus
1994	9(1.1)	15(0.9)	15(0.8)	47(1.6)	13(1.2)
1978	20(1.0)*	17(0.6)	16(0.6)	37(1.2)*	6(0.4)*

* Statistically significant difference between 1978 and 1994 with a 5 percent significance level. Significance tests for extreme percentages (either >90 or <10 percent) should be interpreted with caution. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference. Percentages do not total 100 percent because some students reported "other" (4 percent in 1978 and 1 percent in 1994).

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

Technology in the Classroom. Students' reports indicated an increased use of technology in the classroom. Between 1977 and 1994, there was an increase in the percentage of 9-year-olds who reported using a calculator, thermometer, or microscope in their classrooms.[9] As shown in Table 7, students in 1994 were much more likely to have used a computer in school than were students in the late 1970s and early 1980s. At ages 13 and 17, students reported considerably more access to and use of computers in mathematics classes in 1994 than in 1978. Also, between 1984 and 1994, there was a sharp increase in the percentage of students at grades 8 and 11 who reported using computers to write stories or papers.

[9] A complete discussion of technology use in classrooms is found in the *NAEP 1994 Trends in Academic Progress*.

Table 7

Computer Usage in Mathematics and Writing Instruction, Ages 13 and 17, 1978/1984 and 1994

		PERCENTAGE OF STUDENTS ANSWERING "YES"	
		AGE 13	AGE 17
Studied Mathematics Through Computer Instruction	1994	50(1.8)	34(1.7)
	1978	14(0.9)*	12(1.1)*
		GRADE 8	GRADE 11
Used a Computer To Write Stories or Papers	1994	82(1.7)	87(2.0)
	1984	15(3.5)*	19(2.2)*

* Statistically significant difference between 1978 or 1984 and 1994 with a 5 percent significance level. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

Homework. According to students' reports, there was little change between 1984 and 1994 in the amount of time overall that students spent each day working on homework for all subjects. The only change observed was at age 9, where more students in 1994 than in 1984 reported doing less than 1 hour of homework each day and fewer students reported doing more than 2 hours. In 1994, the percentage of students who reported doing at least 1 hour of homework daily was 16 percent at age 9, 37 percent at age 13, and 39 percent at age 17.[10]

Among 9- and 13-year-olds, there was evidence of slightly more reading for school and for homework in 1994 than in 1984. As shown in Table 8, the percentages of 9- and 13-year-old students who reported reading more

[10] A complete discussion of time spent on homework is presented in the *NAEP 1994 Trends in Academic Progress*.

than 20 pages each day increased over the 10-year period. At age 9, there was a corresponding drop in the percentage of students who reported reading 5 or fewer pages each day. At age 13, there was also an increase in the percentage of students who reported reading 16 to 20 pages as well as a decline in the percentage of students who reported reading only 6 to 10 pages. The reports of 17-year-old students on the number of pages read each day did not change significantly between 1984 and 1994.

Table 8

Pages Read in School and for Homework Per Day, Ages 9, 13, and 17, 1984 and 1994

		PERCENTAGES OF STUDENTS		
		AGE 9	AGE 13	AGE 17
More than 20	1994	17(1.0)	14(0.8)	23(1.5)
	1984	13(0.4)*	11(0.4)*	20(1.0)
16 to 20 pages	1994	14(0.9)	13(0.5)	13(0.6)
	1984	13(0.5)	11(0.2)*	14(0.4)
11 to 15 pages	1994	14(0.5)	17(0.6)	18(0.6)
	1984	14(0.5)	18(0.4)	18(0.3)
6 to 10 pages	1994	26(0.6)	31(0.9)	25(0.9)
	1984	25(0.5)	35(0.5)*	26(0.6)
5 or fewer	1994	28(1.4)	26(0.9)	21(1.2)
	1984	35(1.0)*	27(0.6)	21(0.8)

* Statistically significant difference between 1984 and 1994 with a 5 percent significance level. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

Value for Learning. Some positive trends were observed in students' perceptions about the value of learning different subjects. For example, there was an increase between 1977 and 1994 in the percentage of 17-year-olds who strongly agreed that learning science can be useful in the future and that science should be required in school. At age 13, a smaller percentage of students in 1994 than in 1978 indicated that they were taking mathematics only because it was required. Among fourth graders, a decrease between 1984 and 1994 was observed in the percentage of students who indicated that they would not write anything if it was not required in school.[11]

Factors in the Home. Based on the relatively small number of questions asked, factors in the home that previously have shown a relationship to achievement appeared to change little from assessment to assessment.[12] At age 9, there was an increase in the percentage of students who reported reading for fun daily (see Table 9). However, there was an increase in the percentage of 13-year-olds who reported reading for fun on a yearly basis. No significant change was observed in reading for fun among 17-year-olds. As shown in Table 10, television viewing habits appeared to have changed only slightly since the late 1970s and early 1980s. Nine- and 13-year-olds were less likely in 1994 than in 1982 to watch six or more hours of television each day. However, there was a small but significant increase between 1978 and 1994 in the percentage of 17-year-olds who reported watching six or more hours of television each day.

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[11] A complete discussion of students' perceptions about learning is presented in the *NAEP 1994 Trends in Academic Progress*.

[12] Past NAEP assessments have shown a relationship between achievement and both television watching and reading for fun. (See the *NAEP 1994 Reading Report Card for the Nation and the States*.)

Table 9

Trends in Reading for Fun, Ages 9, 13, and 17, 1984 and 1994

		PERCENTAGES OF STUDENTS		
		AGE 9	AGE 13	AGE 17
Daily	1994	58(1.6)	32(1.8)	30(2.6)
	1984	53(1.0)*	35(1.0)	31(0.8)
Weekly	1994	25(1.5)	32(2.1)	31(1.9)
	1984	28(0.8)	35(1.2)	34(1.1)
Monthly	1994	5(0.6)	14(1.7)	15(1.5)
	1984	7(0.6)*	14(0.8)	17(0.5)
Yearly	1994	3(0.6)	10(1.2)	12(1.5)
	1984	3(0.3)	7(0.5)*	10(0.5)
Never	1994	9(0.8)	12(1.7)	12(1.4)
	1984	9(0.5)	9(0.6)	9(0.6)

* Statistically significant difference between 1984 and 1994 with a 5 percent significance level. Significance tests for extreme percentages (either >90 or <10 percent) should be interpreted with caution. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

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Table 10

Trends in Television Watching, Ages 9, 13, and 17, 1978/1982 and 1994

	PERCENTAGE OF STUDENTS		
	NUMBER OF HOURS WATCHED PER DAY		
	0-2 Hours	3-5 Hours	6 or More Hours
Age 9			
1994	43(1.0)	38(0.9)	19(0.8)
1982	44(1.1)	29(0.6)*	26(1.0)*
Age 13			
1994	38(1.3)	49(1.1)	13(0.6)
1982	45(0.8)*	39(0.4)*	16(0.8)*
Age 17			
1994	53(1.7)	39(1.3)	8(0.7)
1978	69(0.7)*	26(0.6)*	5(0.2)*

* Statistically significant difference between 1978 or 1982 and 1994 with a 5 percent significance level. Significance tests for extreme percentages (either >90 or <10 percent) should be interpreted with caution. The standard errors of the estimated percentages appear in parentheses. It can be said with 95-percent certainty that, for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample. In comparing two estimates, one must use the standard error of the difference.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1994 Long-Term Trend Assessment.

About the *NAEP 1994 Trends in Academic Progress*

A primary purpose of the National Assessment of Educational Progress is to measure trends in academic performance. This *Report in Brief* summarizes selected results from the comprehensive NAEP 1994 trend assessment. An assessment of the magnitude of the 1994 trend assessment produces many more results than can be presented in a summary report such as the *Report in Brief*. A fuller discussion of the trend results is presented in the *NAEP 1994 Trends in Academic Progress*.

The *NAEP 1994 Trends in Academic Progress* provides a broad examination of students' learning in the four core academic subjects — science, mathematics, reading, and writing. In addition to the overall results discussed in this report, more extensive subgroup results are presented and topics summarized in this brief report are expanded and discussed in greater depth. Specific aspects of students' performance and their experiences at home and in school are reviewed at length. Technical documentation for the assessment is also presented.

Readers interested in further details about the 1994 trend assessment results are encouraged to read the *NAEP 1994 Trends in Academic Progress*. This fuller report is scheduled for release in November 1996, and can be ordered by writing to:

National Library of Education
Office of Educational Research and Improvement
U.S. Department of Education
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Washington, D.C. 20208-5641

or by calling 1-800-424-1616 (in Washington, D.C. metropolitan area call 202-219-1651).

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The NAEP project at ETS is directed by Paul Williams and resides in the Center for the Assessment of Educational Progress (CAEP), managed by Archie Lapointe and Paul Williams. Steve Lazer managed test development activities, and Jules Goodison managed operational aspects of the trend assessment. The sampling and data collection activities were carried out by Westat under the direction of Rene Slobasky, Nancy Caldwell, and Keith Rust. Printing, distribution, scoring, and processing activities were conducted by NCS, under the supervision of Judy Moyer, Brad Thayer, Mathilde Kennel, Linda Reynolds, and Barbara Price.

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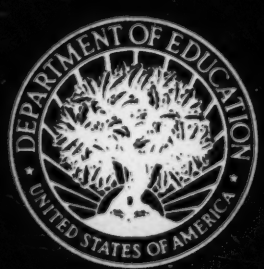

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